



Wading past assumptions: Gender dimensions of climate change adaptation in coastal communities of the Philippines



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1. Introduction

This study explores the gender dimensions of climate change adaptation in select Filipino coastal municipalities located within Palawan, Occidental Mindoro, and Batangas provinces. The goal is to better understand gender dimensions of risk perception, climate change awareness, training, and the potential impact of climate change on resource use, in order to improve climate change adaptation process and policy. This study contributes to the growing understanding of the unique role of women in climate change adaptation, with specific implications for coastal, fisheries-dependent communities. The objectives of this study are to: 1) Identify and challenge assumptions about women and climate change 2) Examine men's and women's beliefs, values, perceptions of risks, resource dependency, and awareness associated with climate change, and 3) Evaluate the implications of gendered relationships with fisheries and the environment on climate change adaptation. The outcome presents opportunities for improved integration of both men and women in effective climate change planning and adaptation.

2. Climate change vulnerability in the Philippines

It is widely accepted that climate change will have a broad range of impacts on social and ecological systems across the world, with particular impact on tropical coastal ecosystems and the fisheries-dependent communities that they support (Food and Agriculture Organization of the United Nations (FAO, 2009). Coral reefs and other coastal habitats are sensitive to climate stressors such as warming seas, coral bleaching, and ocean acidification (Daw et al., 2009; Burke et al., 2011), building on environmental degradation caused by overfishing and destructive fishing (SCTR, 2011). Climate variations that worsen ecological conditions will increase pressure on fisheries and have significant consequences for the communities and economies that depend on them (Daw et al., 2009; Cinner et al., 2012). Furthermore, fisheries production and coastal communities are at risk from flooding and increasingly frequent and intense storms caused by climate change (Mamaug et al., 2013).

The Philippines is an archipelagic country located within the Coral Triangle, a region known for its exceptionally high marine biodiversity. Approximately 50 million residents depend on diverse marine and coastal ecosystems for food security, income and livelihoods (SCTR, 2011). However, coastal mangrove and coral reef ecosystems are significantly degraded (Primavera and Esteban, 2008; SCTR, 2011). Social and ecological systems in the Philippines are considered “very vulnerable” to climate change as a result of factors including overfishing, high dependence on fisheries, high rates of poverty within the fishery sector, population growth, and poor governance (Mamaug et al., 2013).

3. Role of women in fisheries

Women have distinct roles and responsibilities within small-scale fishing villages (Harper et al., 2013). However, the scale of women's contribution to both fisheries and household well-being in fishing communities is often underreported and undervalued (Harper et al., 2013; WorldFish Center, 2010; Weeratunge et al., 2010). The contributions of women continue to be overlooked in part because of the narrow definition of “fishing” as catching fish at sea (Harper et al., 2017). In the Coral Triangle Region and elsewhere, there is a gendered division of labor where many women glean for invertebrates, fruit, and seaweed in near-shore areas (Eisma-Osorio et al., 2012). In Central Philippines, Kleiber et al. (2014) found that women accounted for at least 42% of all fishers, but that fisheries management and policy focuses mainly on the types of fishing activities that are traditionally male dominated.

Women are also integral to pre- and post-harvest activities such as mending nets, processing, buying and selling fish at market (WorldFish Center, 2010). Where men are involved in offshore fishing, women are also left responsible for managing most land-based activities including those usually handled by men such as marketing and distribution of production, preparation of land and cultivating crops, where practiced, and managing household finances. These added land-based responsibilities can give women higher status in fishing villages, compared to non-fishing communities (Pollnac, 1988). Despite this, the power of women within the fishing sector is weakened by limited access to

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certain resources. Generalized conceptions of women within fisheries create barriers to effective policy, which must give women access to resources and address all facets of marginalization along the entire fisheries value chain (Lentisco and Lee, 2015).

4. Women and climate change

Recent analyses have paid significant attention to the gender dimensions of climate change vulnerability and adaptation. Vulnerability to climate change is a function of exposure to risk, sensitivity to change, and adaptive capacity, which vary considerably within and between countries and populations (Cinner et al., 2012; Adger et al., 2005; Daw et al., 2009). Vulnerability of social and ecological systems can be reduced through climate change adaptation: the way in which societies, organizations and individuals adjust behavior according to assessment and anticipation of future climatic conditions (Adger et al., 2005).

The discourse about women and climate change evolves out of a broader debate around eco-feminist theory and the relationship between women and the environment. Eco-feminism is founded on the connection between the exploitation of nature and the oppression of women (or other marginalized groups) under prevailing systems. As a contested product of this relationship, women are seen as natural and essential stewards of the environment (Jumawan-Dadang, 2015). By extension, the discussion about women and climate change focuses primarily on the distinctive vulnerability of women to climate change impacts, the roles and responsibilities of women in climate change response, and how women contribute to climate change policy and adaptation planning (Masika, 2002).

In general, data show that climate impacts in developing countries may affect men and women differently (Goh, 2012). The degree to which gender influences vulnerability, risk exposure and capacity to respond is an ongoing discussion (Masika, 2002; Goh, 2012). In developing countries, pre-existing inequalities tend to provide women with less access to income, assets, resources, technology, training and decision-making power than men (WorldFish Center, 2010; Masika, 2002). These disparities can potentially limit adaptive capacity and expose women to greater risk, making them more vulnerable to the impacts of climate change (FAO, 2009). More specifically, some research suggests that women in developing countries are disproportionately poor, more highly exposed to risks from natural disaster (Neumayer and Plümper, 2007), and more sensitive to environmental degradation due to a more direct dependence on the natural resources (Brown, 2011; Nelson et al., 2002). Specifically, in coastal Philippines, gendered divisions of labor may shape women's relationship to nature (Jumawan-Dadang, 2015), and therefore climate impacts. However, claims about women's vulnerability to climate change tend to generalize the complex relationships that define women, poverty and the environment (Demetriades and Esplen, 2008).

Some research also suggests that adaptive response to climate change may be influenced by gender differences. Environmental risk perception, a motivating factor in climate change response, may be influenced by gender through socio-economic and demographic variables, experiences, values and beliefs (O'Connor et al., 1999; Brody et al., 2008; Tam and McDaniels, 2013; Price et al., 2014), resource dependency (Combest-Friedman et al., 2012), and climate change awareness (Lata and Nunn, 2011). Adaptive response is also dictated in part by environmental attitudes. Qualities that are more commonly attributed to women such as “closeness to nature” and “environmental virtuousness” tend to prescribe roles for women in climate change response that add responsibility without reaping rewards (Masika, 2002; Arora-Jonsson, 2011; Nelson et al., 2002).

In discussions of climate change vulnerability and adaptation, it is increasingly recognized that these prevalent generalizations are problematic because they lack empirical support and fail to recognize local context (Demetriades and Esplen, 2008; Weeratunge et al., 2010; Arora-Jonsson, 2011). Generalizations that treat all women as a homogenous

group, especially in terms of poverty and the environment, can be useless or detrimental to effective and equitable climate change adaptation (Demetriades and Esplen, 2008; Arora-Jonsson, 2011; Goh, 2012). Recent studies call for empirical, site-specific, gender disaggregated data that challenge these assumptions and contribute to a more intersectional understanding of how communities are impacted by, cope with, and perceive risk associated with climate change—information that can contribute to gender equitable climate change adaptation process and policy (Djouidi et al., 2016; Goh, 2012; WorldFish Center, 2010; Masika, 2002).

“Gender Mainstreaming” can be defined as incorporating gender considerations at all levels of government or organization operations including the development process, policy making, budgetary planning, and evaluation (Bennett, 2005). In the Philippines, The Climate Change Act of 2009 (RA9729) and the National Climate Change Action Plan (2011) both call for gender mainstreaming through gender-sensitive and responsive adaptation and planning (Climate Change Commission, 2011). Efforts to mainstream gender into policy, however, also risk simplifying a need that is too complex to be addressed only by disaggregating data, incorporating language into policy documents, and inviting women to participate (Cornwall, 2003).

4.1. The Coral Triangle Initiative

The Coral Triangle Initiative (CTI) is a formal agreement formed in 2009 between the Philippines, Indonesia, Malaysia, Solomon Islands, Papua New Guinea and Timor Leste (referred to as the CT6) to pursue improved regional marine governance and conservation in the Coral Triangle Region. The CTI is supported in part by the US Government through the US CTI Support Program (USCTI), which committed more than \$40 million to assist the CT6 from 2009–2013. This support is channeled as technical and financial assistance through the Coral Triangle Support Partnership (CTSP). In the Philippines, CTSP is headed by World Wildlife Fund and Conservation International, which work with local government units, municipalities, and national government offices to achieve CTI goals. One of the main priorities was to achieve climate change adaptation measures. The USCTI was also involved in local climate change vulnerability assessment and adaptation planning in the Philippines. Gender mainstreaming is included within each goal, with a specific mention that climate change adaptation planning teams should represent a balance of gender and social groups in the community, and stakeholder outreach should include both men and women (USCTI, 2013).

5. Research questions

This study examines how gender influences climate change risk perception, awareness, and adaptation in sites across three provinces of the Philippines. As a country within the Coral Triangle Region, with populations that are highly dependent on diverse marine resources and vulnerable to climate change impacts, the findings can be particularly informative. It is also an area of interest based on involvement in the Coral Triangle Initiative, offering some perspective on the climate change adaptation portion of CTI goals. Building off of evolving literature concerning women, the environment, climate change, the gendered roles of women in coastal Filipino communities, and the existence of gender mainstreaming in climate change adaptation documents in the Philippines, this study uses USCTI LP survey data to address the following questions about the coastal villages sampled: (1) Do women feel more connected to nature (in this case, the marine environment) and demonstrate pro-environmental values? (2) Do women feel more at risk to threats associated with climate change? (3) Are women more likely to report degradation of coastal resources and changes in weather patterns? (4) Are women more likely to participate in climate change awareness training and public outreach activities? (5) Are women more aware of climate change and adaptation plans? (6)

Did USCTI activities have an influence on gender differences? Within the context of gender, climate change, and fisheries, these questions provided a basic framework on which to build deeper analysis of climate change adaptation implications and recommendations.

6. Methods

6.1. Sample

This research was carried out using data from a larger US CTI Learning Project (LP) data collection process. The LP examined lessons learned, results, and outcomes of the USCTI (Christie et al., 2014). The LP team conducted community level surveys in the Philippines, Indonesia, Solomon Islands and Timor Leste. This study uses the data collected in the Philippines, which includes 30 coastal villages within 13 municipalities and three provinces. The LP distinguished between “project” and “control” municipalities to examine impacts of CTSP efforts. Within this sample, 20 randomly selected villages fall within “project” municipalities where CTSP (World Wildlife Fund or Conservation International) had worked towards CTI goals in cooperation with local governments and partners supported through USCTI. 10 coastal villages were chosen randomly within “control” municipalities, which were chosen based on proximity and comparability to project municipalities. The sample for this study includes villages from within both project and control municipalities. All data collection occurred in the provinces of Palawan, Occidental Mindoro and Batangas, the latter two of which comprise the “Verde Island Passage” region (Fig. 1).

In each village, at least 30 marine resource users were randomly sampled, along with purposive sampling of at least one village official and conservation leader. The individual resource user is the primary

unit of analysis for this study. The total sample was 921, including 541 men and 380 women. A team of four women from Coastal Conservation & Education Foundation, a non-profit organization based in Cebu, collected field survey data between July and September 2013. The enumerators, who are fluent in both Tagalog and Cebuano, translated surveys from English and conducted them primarily in Tagalog.

6.2. Survey design

Social surveys included questions about perceptions and practices of coastal resource management including climate change, marine protected areas, and fisheries management. Survey questions were determined by the LP project team (Christie et al., 2014), based on goals of the LP and review of CTSP documents. Some questions were adapted from previous studies in the Philippines (Christie et al., 2009; Combest-Friedman et al., 2012; Pollnac and Crawford, 2000), all referred to below.

6.3. Analytical methods

Data were analyzed using standard statistical software (SPSS). The dependent variables were analyzed relative to gender, years of education, and primary occupation or livelihood. Enumerators described livelihood or occupation as the individual's method of income or subsistence. Participants self-identified according to this description, and the responses were coded into the major categories in Table 2.

6.3.1. Measurement of dependent variable indicators

The following questions were selected out of a larger set of survey questions administered to resource users in each village. They were

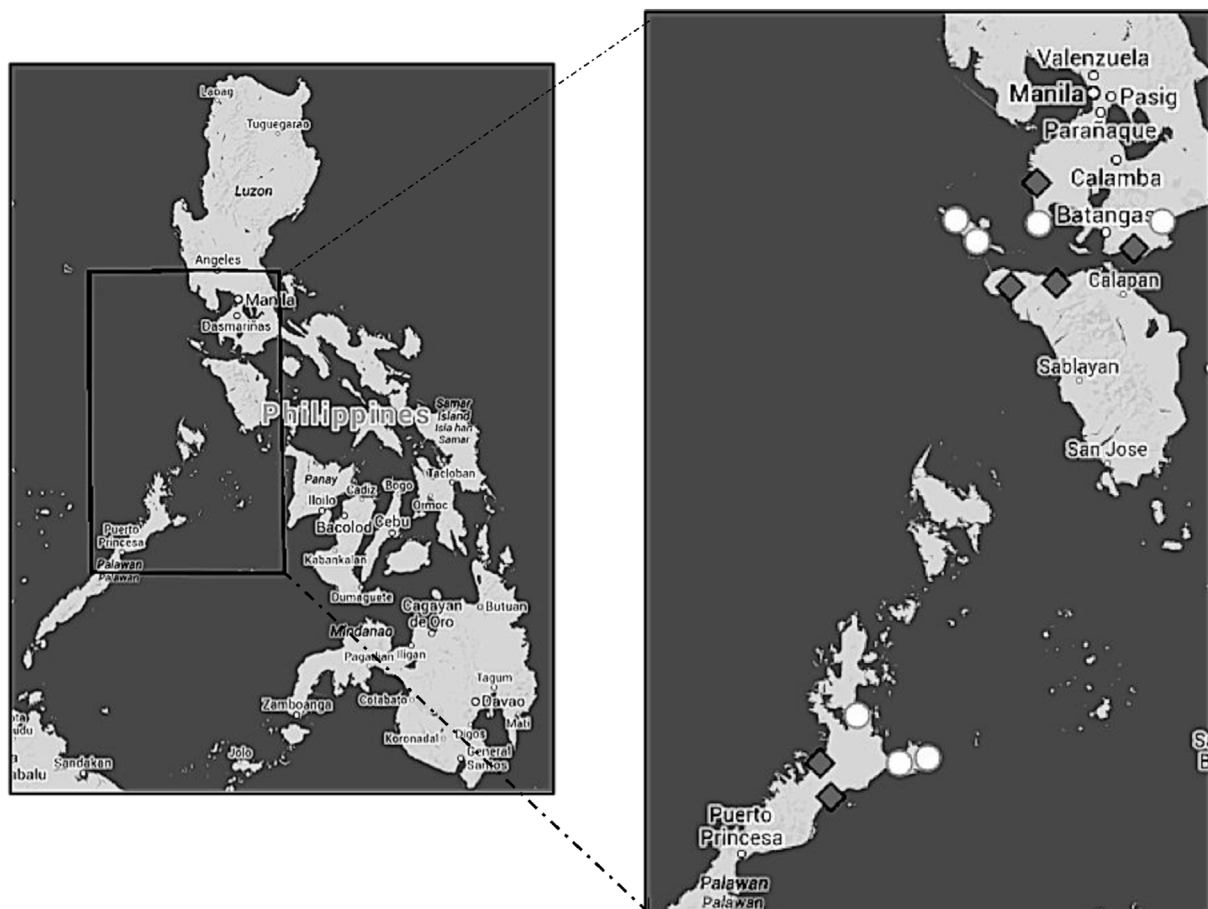


Fig. 1. Map of Project municipalities (white circles) and Control municipalities (gray diamonds) within Palawan and the Verde Island Passage in the Philippines.

Table 1
Dependent variables and associated survey questions.

Dependent Variable	Question
1 Closeness to nature	Please circle the picture that best describes your relationship with the marine environment (see Fig. 2)
2 Conservation Beliefs	9 Question conservation belief scale (refer to text below)
3 Risk Perception	(1) Do you feel that your assets (house, boat, crops, livestock, land) are presently at risk to the following events ... (2) Do you feel that your livelihood/occupation are presently at risk to the following events <i>Flooding, coastal erosion, ocean tides, coral bleaching, and overfishing.</i>
4 Coastal Resource Perception	In the last five years, have coral reef conditions ... In the last five years, have mangrove conditions (1) <i>gotten much worse</i> (2) <i>a little worse</i> (3) <i>not changed</i> (4) <i>improved a little</i> or (5) <i>improved a lot</i> ?
5 Coastal Ecosystem Resource Benefits	(1) What value do coral reefs have for you and your community? (2) What value do mangroves have for you and your community?
6 Climate Change Awareness	Have you heard of climate change or global warming?
7 Climate Change Observation	What changes in weather have you observed in your village over the past thirty years?
8 Climate Change Training	Have you participated in activities that raise public awareness about the condition of the ocean and/or climate change? (i.e., media campaigns, videos, presentations)? Is there a mangrove planting program in this area? Have you been involved in mangrove planting projects?
9 Climate Change Adaptation Planning	Do you, your community, or your municipal government have a plan to cope with climate change events (i.e. flooding, coastal erosion, etc.)?

Table 2
Chi square results demonstrating the percentages of men and women involved in occupations where there was a significant difference between genders.

Occupation	% Male	% Female	Chi-Square	df	p-value
Fisherfolk	66.9	30.1	120.59	1	< .001
Fisher/Farmer	23.3	9.2	30.63	1	< .001
Gleaning	3.9	36.7	166.49	1	< .001
Farmer	3.9	9.0	10.22	1	.001
Seaweed Farmer	3.1	6.9	6.80	1	.009
Housewife	0.2	32.4	198.44	1	< .001

chosen based on applicability to stated research questions. Each dependent variable and associated question is summarized in Table 1 below. A more detailed description is provided below.

1. Closeness to nature

Because positive environmental behaviors tend to entail personal sacrifice for long-term environmental or collective benefit, values that promote social or group benefit are found to motivate environmental behavior more than values that support individual self-benefit (Price et al., 2014). Individuals who include “nature” in their representation of self are more inclined to pro-environmental attitudes (Davis et al., 2009). Therefore, environmental behaviors may be linked to the extent

to which nature is included in concepts of self (Price et al., 2014). The diagram (Fig. 2) used to determine overlap of self and nature, in this case the marine environment, was adapted from a diagram developed and used previously by Davis et al. (2009).

2. Conservation Beliefs

To determine whether gender has an impact on certain conservation beliefs, the following nine statements were read to respondents:

1. *We have to take care of the land and the sea or it will not provide for us in the future.*
2. *Fishing would be better if we cleared the coral where the fish hide from us.*
3. *If our community works together we will be able to protect our resources.*
4. *Farming in the village can have an effect on the fish.*
5. *If we throw our garbage on the beach, the ocean takes it away and it causes no harm.*
6. *We do not have to worry about the air and the sea, God will take care of it for us.*
7. *Unless mangroves are protected we will not have any small fish to catch.*
8. *There are so many fish in the ocean that no matter how many we catch, there will always be enough for our needs.*
9. *Human activities do not influence the number of fish in the ocean.*

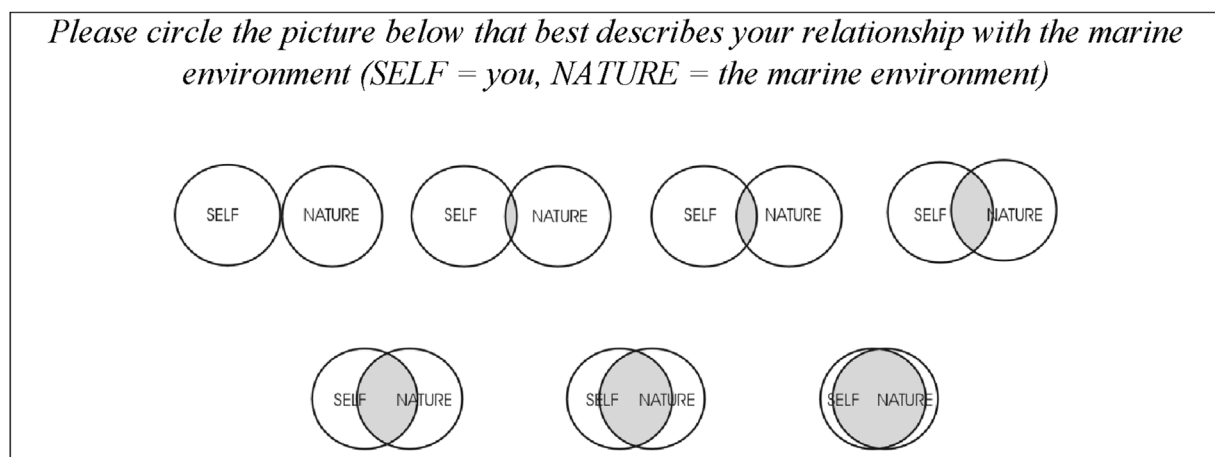


Fig. 2. Diagram and instructions used in Resource User survey to identify connection to the marine environment, measured as the inclusion of the ‘marine environment’ in concepts of ‘self.’ The first picture represents no overlap, and the last represents almost complete overlap between self and the marine environment.

Respondents then determined their degree of agreement according to the following options:

Agree strongly Agree Unsure Disagree Disagree strongly

Answers were ranked from 1 to 5, where 1 implied a negative conservation belief, and 5 implied a positive conservation belief. The conservation belief scale is a sum of the responses to each statement, with 45 as the highest possible total. This scale has been used previously in Indonesia (Pollnac and Crawford, 2000).

3. Risk Perception:

As a way of measuring whether respondents felt that their assets (i.e. house, boat, crops, livestock, land) or livelihoods (i.e. occupation) were at risk, they were asked these two questions:

- (1) *Do you feel that your assets (house, boat, crops, livestock, land) are presently at risk to the following events:*
- (2) *Do you feel that your livelihood/occupation are presently at risk to the following events:*

followed by a list of potential events: Flooding, coastal erosion, ocean tides, coral bleaching, and overfishing.

For each event, respondents selected either “yes” or “no.” The climate change hazards (flooding, coastal erosion, ocean tides, coral bleaching) were chosen following Combest-Friedman et al. (2012), which selected hazards based on projected regional climate impacts, initial climate projections for the Philippines, and consideration of relevance to fisherfolk, conservation, climate change adaptation planning, and integrated coastal management. “Overfishing” was added as a supplemental hazard to better understand compounded risks of local resource pressure and climate change.

4. Coastal Resource Perceptions

Respondent perceptions of recent changes in ecosystem conditions were gathered using the following two measures, in which perceived changes in coral and mangrove conditions were ranked on a scale from 1 to 5:

In the last five years, have coral reef conditions:

- 1) gotten much worse, 2) a little worse, 3) not changed, 4) improved a little or, 5) improved a lot?

In the last five years, have mangrove conditions:

- 1) gotten much worse, 2) a little worse, 3) not changed, 4) improved a little or, 5) improved a lot?

These questions have been effectively used in the Philippines (Christie et al., 2009; Pollnac et al., 2001). Fishers are acutely aware of variable environmental conditions and coastal inhabitants act based on perceptions of environmental change (Pollnac, 1988). Environmental knowledge and awareness in fisheries is also linked to traditional gender roles (Siar, 2003).

5. Coastal Ecosystem Resource Benefits:

To measure how individual resource users valued the benefits of coral reefs and mangrove ecosystems, the two following open-ended questions were asked. Each answer mentioned by respondents was circled, while answers that fell outside of given categories were recorded but not analyzed in this study. These questions were selected to reflect resource uses and dependency of respondents.

- (1) *What value do coral reefs have for you and your community?*
 - a) *Fish nurseries/supporting fisheries*

- b) *Building material*
- c) *Protection from waves*
- d) *Tourism*
- e) *Natural habitat*

- (2) *What value do mangroves have for you and your community?*

- a) *Fish nurseries/supporting fisheries*
- b) *Firewood*
- c) *Building material*
- d) *Protection from flooding and other natural disaster*
- e) *Tourism*
- f) *Natural habitat*

6. Climate Change Awareness

To determine climate change awareness, respondents were asked the following question, and responded either yes or no:

Have you heard of climate change or global warming?

7. Climate Change Observation

Each respondent's observation of weather pattern changes in his/her village was determined with the following open-ended question:

What changes in weather have you observed in your village over the past thirty years?

- (a) *Rainfall*
- (b) *Coral Bleaching*
- (c) *Temperature*
- (d) *Storms/Cyclones*
- (e) *Wind*
- (f) *Waves*

Observed weather changes were circled as they were mentioned, or written in if they did not fall under a prepared category.

8. Climate Change Training

Three survey questions were used to determine participation in public outreach activities, participation in mangrove planting, and awareness of mangrove planting projects:

Have you participated in activities that raise public awareness about the condition of the ocean and/or climate change? (i.e., media campaigns, videos, presentations)? (yes or no).

Is there a mangrove planting program in this area? (yes or no)

Have you been involved in mangrove planting projects? (yes or no ~ Only asked if respondent is aware of mangrove planting program).

9. Climate Change Adaptation Planning

For each decision-making level (individual, community, and municipal), respondents answer “yes,” “no,” or “don't know” to the question:

Do you, your community, or your municipal government have a plan to cope with climate change events (i.e. flooding, coastal erosion, etc.)?

At the individual level, a positive answer assumes that a person has adopted an individual plan to cope with climate change. At the community and municipal governance levels, a positive response assumes that a person is aware of a community or municipal climate change adaptation plan. At these levels, “don't know” or “no” answers both imply that the person is unaware of community or municipal plans.

7. Results

Within the sample, men were significantly more likely than women to identify as fisherfolk and as fisher/farmers. Women were significantly more likely than men to identify as gleaners, farmers, and seaweed farmers. Among women, the most common occupation was

‘gleaner,’ followed by ‘housewife’ and ‘fisherfolk,’ when each respondent was free to report multiple occupations (i.e., occupations are not mutually exclusive) (Table 2).

7.1. Connections with the marine environment

While both men and women felt highly connected to the marine environment, women actually felt significantly less connected than men. On a scale of 1–7, where 1 is minimal overlap between self and the marine environment and 7 is the almost complete overlap (Fig. 2), women on average scored a 5.91 and men scored 6.19 (Mann Whitney U: 93320.5, $p = .009$, $n = 918$).

7.2. Conservation beliefs

Measurement of “conservation mindedness” using the scale described above found that women did not differ from men with regard to positive conservation attitudes and beliefs concerning marine resources (34.7 men, 34.8 women, $p = .548$, $df = 767$, $t = 0.6$).

7.3. Perceptions of risk and environmental degradation

Men within the study sites were found to be significantly more likely than women to feel that both their assets and livelihoods or occupations are at risk to impacts associated with climate change and coastal resource degradation. In particular, men were significantly more likely than women to feel that their assets (house, property, etc.) are at risk due to coral bleaching and overfishing. Men were also significantly more likely than women to feel that their livelihoods or occupations are at risk to coral bleaching and overfishing. However, gender had no influence on whether individuals felt at risk due to flooding, coastal erosion, or ocean tides (Table 3).

Interestingly, women and men were equally likely to report changes within the past five years in conditions of coral reefs (U: 4280, $p = .22$), mangroves (U: 5263.5, $p = .369$) and fisheries (U: 5633.5, $p = .832$). So, even though men felt at risk to overfishing, women were just as likely to report deteriorating conditions of fisheries and coral reefs.

Individuals who identified as fisherfolk were significantly more likely to feel that their assets and livelihoods are at risk to coral bleaching, overfishing and ocean tides. For both livelihoods and assets, identifying as fisherfolk had no significant influence on perceptions of risk to both erosion and flooding (Table 4).

7.3.1. Perceived benefits of coastal ecosystems

Women were significantly more likely than men to list “firewood” and “building materials” as a benefit of mangroves in their community. On the other hand, men were significantly more likely than women to cite mangroves as being beneficial to the community as nurseries for fisheries. Similarly, men were more likely than women to say that coral reefs benefit the community as fish nurseries and for tourism (Table 5).

Table 3
Influence of gender on perceptions of asset and livelihood risks.

	% Men	% Women	Chi Square	df	p-value	n	Phi
Asset Risk							
Coral Bleaching	72.3	62.7	8.712	1	0.003	858	−0.101
Overfishing	70.7	59.4	12.073	1	0.001	882	−0.117
Flooding	71.8	69.6	0.492	1	0.492	907	−0.023
Coastal Erosion	74.9	75.6	0.057	1	0.811	903	0.008
Ocean Tides	81.1	79.9	0.213	1	0.671	913	−0.015
Livelihood Risk							
Coral Bleaching	88.4	81.6	8.039	1	0.005	878	−0.096
Overfishing	81.9	75.3	5.555	1	0.036	894	−0.079
Flooding	89.0	87.0	0.887	1	0.346	913	−0.031
Coastal Erosion	81.5	81.0	0.040	1	0.841	905	−0.007
Ocean Tides	87.5	86.2	0.309	1	0.578	914	−0.018

Mangrove planting and restoration is commonly included in climate change adaptation planning strategies, partially because of the protection they provide from flooding, erosion, and sea level rise. Women and men are equally likely to be aware of mangrove planting projects (Men 41.2%, Women 41.5%, Chi Square: .006, $df = 1$, $p = .936$, $n = 878$) and to participate in them (Men 37.7%, Women 37.7% Chi Square: .000, $df = 1$, $p = .990$, $n = 374$). Although 37.7% (both men and women) have participated in mangrove planting, only 20.9% of all respondents listed “protection” as a value of mangroves, and even fewer (3.9%) listed this as a value of coral reefs. In both cases, gender did not influence whether an individual valued mangroves and coral reefs for protection (Table 5).

7.3.2. Climate change awareness

Men were significantly less likely to be aware of climate change (56.5% men, 63.7% women; Chi Square: 4.75, $df = 1$, $p = .03$, $n = 917$).

7.3.3. Climate Change Observation

Although the women in our sample did not feel significantly more connected to nature or environmentally conscious, our results demonstrated that women are more likely than men to report changes in certain weather patterns within the last 30 years. In particular, women are statistically significantly more likely to note changes in temperature patterns and rainfall patterns (Table 6).

7.3.4. Climate Change Training

Although men were less likely to be aware of climate change, men (14.7%) are statistically significantly more likely than women (9.3%) to have participated in public awareness activities related to the ocean and climate change (Chi square: 6.027, $df = 1$, $p = .014$, $n = 913$). However, when the sites were split into CTSP project and control sites, this difference was only true for control sites (Chi Square: 6.081, $df = 1$, $p = .014$, $n = 320$), where 9.2% of women attended compared to 19.9% of men. In CTSP project sites, a smaller proportion of men attended public awareness activities (11.4% of men compared to 9.3% of women), such that there was no significant difference between genders (Chi Square: .663, $df = 1$, $p = .415$, $p = 593$).

Furthermore, in all sites, there is no gender difference in participation in Climate Change trainings (5.6% of men, 6.1% of women, Chi Square: .110, $df = 1$, $p = .740$, $n = 917$), in contrast to the public awareness activities discussed above.

7.4. Climate change adaptation planning

Women were statistically significantly more likely than men to be aware of a municipal climate change adaptation plan (96.7% of women, versus 93.8% of men, Chi Square: 2.848, $df = 1$, $p = .045$ (one-tailed), $\Phi = .067$). Women are also significantly more likely than men to be aware of a community climate change adaptation plan (90.8% of women, 86.1% of men, Chi Square: 3.175, $df = 1$, $p = .038$, $\Phi = .072$ (one-tailed)). Men and women were equally likely to have adopted an individual plan to cope with the impacts of climate change (61.4% of men, 61.0% of women, Chi Square: 0.277, $df = 1$, $p = 0.599$, $\Phi = 0.018$, $n = 869$). Further, individuals residing in villages that market marine resource products at the municipal level are significantly more likely to be aware of a municipal climate change adaptation plan ($p = .026$, $n = 29$).

8. Discussion

8.1. Gender roles, relationships to the marine environment, and implications for results

The reported livelihood distribution (Table 2) corroborates accounts that women in the Philippines are more heavily involved in pre- and

Table 4

Chi Square results showing the percentages of fisherfolk and non-fisherfolk who felt their assets and livelihoods were at risk due to certain threats, regardless of gender.

	% Fisherfolk	% Non-Fisherfolk	Chi Square	df	P-value	n	Phi
Asset Risk							
Coral Bleaching	75.8%	60.8%	22.306	1	< .001	861	0.161
Overfishing	74.9%	56.7%	32.779	1	< .001	886	0.192
Flooding	70.9%	71.2%	0.014	1	.907	911	-.004
Coastal Erosion	75.7%	74.4%	.633	1	.633	907	.016
Ocean Tides	85.6%	75.7%	14.614	1	< .001	917	.126
Livelihood Risk							
Coral Bleaching	91.9%	79.0%	30.143	1	< .001	881	0.185
Overfishing	86.5	71.5	30.905	1	< .001	898	0.186
Flooding	88.2%	88.5%	0.028	1	.868	917	-.005
Coastal Erosion	81.1%	81.7%	0.056	1	.814	909	0.008
Ocean Tides	92.0	82.0	20.471	1	< .001	918	0.149

Table 5

Percentages of men and women that reported certain benefits of mangrove and coral reef ecosystems.

	% Men	% Women	Chi-Square	Df	p-value	n
Mangrove Benefits						
Firewood	11.65	17.79	5.09	1	0.02	676
Building Materials	22.28	28.83	3.75	1	0.05	676
Fish Nurseries	58.73	50.18	4.86	1	0.03	676
Protection	25.82	21.35	1.80	1	0.18	676
Habitat	64.05	61.21	0.57	1	0.45	676
Don't know	4.56	6.76	1.54	1	0.21	676
Coral Reef Benefits						
Fish Nurseries	74.5	59.9	20.25	1	< .001	842
Tourism	5.77	1.77	8.11	1	< .001	842
Protection	3.38	4.42	0.60	1	0.44	842
Habitat	75.60	70.50	2.70	1	0.101	843
Don't know	2.98	10.59	20.72	1	< .001	844

Table 6

Percentages of men and women that reported changes in each weather pattern type within the past 30 years.

	% Men	% Women	Chi-Square	df	p-value	n
Temperature	33.1	40.9	5.704	1	0.017	898
Rainfall	24.2	32.5	7.564	1	0.006	897
Storms	31.9	37.5	2.952	1	0.086	897

post-harvest activities as well as gleaning in near-shore areas (Eisma-Osorio et al., 2012). The relatively high involvement of men in offshore fishing, compared with women's greater role in household responsibilities and nearshore gleaning, reflects a difference in the way men and women interact with the marine environment on a daily basis. In fact, Siar (2013) found that in Palawan, access to resources and knowledge about those resources are influenced by gender and resource use practices, where women are more knowledgeable about the intertidal zone and men are more knowledgeable about coral reef and deep water fisheries. These gender differences in marine resource dependency in Filipino coastal communities help explain many of the results, as discussed below with regards to each variable.

8.1.1. Connection to nature and conservation beliefs

The context-specific ways in which men and women relate to marine and coastal resources explains results regarding connection to nature and conservation beliefs. Men in the study sites reported a slightly higher connection than women to the marine environment, building on a growing body of research refuting common assertions that women are “closer to nature” (Arora-Jonsson, 2011). Again, this is likely a reflection of gendered livelihood roles, where women tend to be more heavily involved in pre- and post-harvest activities, household obligations, and marketing. Also, women may not consider the

intertidal zone, where they spend time gleaning, to be a part of the ‘marine environment.’

Men and women were also equally likely to have positive conservation beliefs, challenging the concept of women as exceptionally environmentally virtuous, and therefore more inclined or suited to participate in climate change mitigation and adaptation efforts (Arora-Jonsson, 2011). It is important to note, however, that the scale of ‘conservation beliefs’ focuses heavily on ‘fish in the ocean’ and specifies coral reef health. Women may have greater ecological knowledge about intertidal zones, while men are more familiar with coral reefs and deep water ecosystems (Siar, 2003). It is possible, therefore, that a scale with more gender-neutral examples would have yielded different results.

8.1.2. Ecosystem benefits

The ways in which men and women value the benefits from coastal resources also reflects gender-defined roles. Women are more likely to note the benefits gained from the uses of mangroves that they directly relate to on a daily basis (fuelwood and building materials), while men mainly refer to benefits of mangroves as nurseries for fisheries. This is logical, since women tend to be more commonly involved in gathering mangrove wood (Siason, 2000), and men were more likely to identify as fisherfolk (Table 2).

Since men and women equally noted ‘protection’ as a value of mangroves and coral reefs (Table 5), it also demonstrates that perceived values of mangroves and coral reefs are less likely to be gendered if the value extends beyond directly supporting livelihoods. Again, this demonstrates different ways in which men and women interact with the environment, and therefore have implications for how climate change adaptation will impact them.

8.1.3. Risk perception

On one hand, men's relatively high sensitivity to risk from overfishing and coral bleaching may be unexpected in light of studies reporting that women are generally less tolerant to environmental risk (Bord & O'Connor, 1997). In this sample, the heightened sensitivity of males to overfishing and coral bleaching risk is best explained by gender differences in livelihoods and resource dependency in Filipino coastal communities. Within the study sites, men identified primarily as ‘fisher’ more frequently than women, who are active in nearshore gleaning. It is logical that men perceive a greater threat to the type of fishery in which they participate. Coral bleaching and overfishing are both threats specific to near or offshore fisheries, and are not associated with intertidal gleaning. Other impacts such as flooding, erosion, and encroaching tides are less likely to have a direct impact on fish catch. Men and women were likely to perceive equally the risk that the latter three factors pose to both assets and livelihoods.

This finding is supported by Combest-Friedman et al. (2012), who found that differences in resource dependency can affect risk perception. Fishing households in one municipality of the Philippines were more likely to feel that livelihoods were at risk to impacts of climate

change (flooding, coastal erosion, and sea level rise) than urban households, reinforcing the positive relationships between resource dependency and livelihood risk that has been found in other studies (Combest Friedman et al., 2012).

The idea that gendered livelihood differences underlie the disparity in risk perception between men and women is supported by further examining the relationship between occupation and risk perception within the study sample. Individuals who identified as fisherfolk were significantly more likely to feel that their assets and livelihoods are at risk to coral bleaching, overfishing and ocean tides. For both livelihoods and assets, identifying as fisherfolk had no significant influence on perceptions of risk to both erosion and flooding (Table 4). This demonstrates the clear link between livelihoods and perceptions of risks related to resource health. Compounded with the recognition that men and women have distinct roles in small-scale fisheries, it demonstrates a context-specific rationale for the gendered differences in risk perception.

8.2. Climate Change Training and awareness

Women in the sample were more aware than men of municipal and community climate change adaptation plans. Although some sources report that women do not have time to attend meetings, women in fishing communities spend more time devoted to managing the household activities while men fish offshore for long periods of time (Pollnac, 1988). It is logical then that they would be more involved in community activities. This is supported by one study suggesting that women are more likely to attend community meetings in the Philippines (Siason, 2000). Awareness of a municipal plan could also be linked to the marketing of fish in municipal markets, which is primarily the job of women while men are responsible for offshore fishing. Therefore, in fishing villages women may be more likely to have access to information disseminated in town and municipal centers. The finding that individuals residing in villages that market marine resource products at the municipal level are significantly more likely to be aware of a municipal climate change adaptation plan implies that marketing fish is somehow connected to awareness of these plans, which has implications for women because of their dominant role in fish markets.

Some studies have found that assumptions about women's connection to nature gives women added responsibility in climate change mitigation projects such as tree planting, adding responsibility to already burdened schedules without necessarily empowering women in climate change decision making (Arora-Jonsson, 2011). These results show that women and men in study sites are equally sharing the responsibility of mangrove planting. It shows also that women are not being excluded from mangrove planting projects, which are often in conjunction with awareness-raising activities. While some studies report that women are less likely to have participated in trainings and community meetings due to time burdens, our finding specific to mangrove planting is consistent with Siason's (2000) observation that women were more likely to attend community meetings in one case in the Philippines.

Awareness of climate change impacts is considered to be an important element of adaptive capacity and an enabler of climate change adaptation. Public outreach and education activities are common components of adaptation toolkits that seek to improve local adaptive capacity through knowledge and awareness (Lata and Nunn, 2011). Motivation to adapt and act in the face of climate change is also linked to observation of changes or impacts associated with climate change. Women were more aware of climate change, and also statistically more likely to report changes in temperature and rainfall patterns.

In both project and control sites, 9.3% of women attended trainings related to ocean or climate change awareness. But, in CTSP project sites, a fewer percentage of men attended than in control sites. In other words, men were less likely to participate in ocean or climate change public awareness activities in CTSP project sites than in control sites.

These results could be related to any number of factors such as training schedule or topic. It is plausible that by being intentionally inclusive of women, trainings were held at times or on topics that inadvertently discouraged men's attendance.

9. Conclusions and recommendations

9.1. Climate change education, planning and awareness

Public outreach and education activities are common components of climate change adaptation toolkits that seek to improve local adaptive capacity through knowledge and awareness (Lata and Nunn, 2011). Throughout all study sites, men and women were equally likely to attend public outreach activities. Despite equal participation, women were overall more likely than men to be aware of both community and municipal climate change adaptation plans. This awareness could be linked to the daily responsibilities of women in fishing communities, where women may be more involved in land-based or very nearshore (e.g. gleaning) activities while men for the most part take on offshore fishing responsibilities. The relationship between marketing fish at municipal levels and corresponding awareness of climate change adaptation plans suggests that some communication and learning about climate change adaptation may occur through the fish marketing process where women have contact with other social networks. It is interesting to note that in CTSP project sites, a smaller proportion of men participated in outreach activities compared to control sites. Perhaps CTSP outreach activities focused on topics that were more targeted to include women, and thereby reduced attendance by men. More specific information would have to be gathered to gain a better understanding of mechanisms of sharing information, outreach methods and materials, and training activity schedules. And while awareness does not necessarily imply influence in the process, women's heightened awareness of climate change adaptation plans may suggest greater involvement in climate change adaptation planning processes.

Tree planting is an adaptation and conservation activity that has been found to disproportionately rely on the labor of women based on an impression of their inherent 'conservation-mindedness' (Brown, 2011). However, in the study sites, men and women were equally likely to participate in mangrove planting. This contradicts other findings that conservation initiatives rely heavily on women's participation (Brown, 2011; Masika, 2002; Arora-Jonsson, 2011; Nelson et al., 2002). It also has positive implications for the equal inclusion of women in climate change awareness and training, since mangrove planting is often offered in conjunction with outreach and planning activities.

The different ways in which men and women value mangroves could have implications in climate change adaptation policies that prohibit mangrove deforestation. While men's value of mangroves is enhanced by preservation, women may be disadvantaged by no longer having access to mangroves to extract wood for cooking and building. In the Philippines, cutting of mangroves is common despite being illegal (Primavera and Esteban, 2008). Climate change adaptation policy or toolkits that prohibit mangrove cutting should target women in outreach and education to build awareness of the importance of mangroves as nurseries that support gleaning. Also, women who depend on extractive uses of mangroves may benefit from sustainably sourced firewood and targeted alternative livelihoods, in response to restrictions to mangrove cutting.

9.2. Gender, resource dependency, and climate change adaptation

Assumptions about women's connection to nature, conservation attitudes, and the role they should play in climate change adaptation are increasingly contested in gender research (Arora-Jonsson, 2011; Brown, 2011). To avoid policy that perpetuates generalizations, true adaptation processes must account for not only site-specific gender dimensions, but also the social, political and cultural systems that

contribute to marginalization and vulnerability (Djoudi et al., 2016). Although the survey questions that were not designed to provide a comprehensive intersectional analysis of gender dimensions of climate change adaptation, they do offer insights into the multiple dimensions of gender roles, fisheries and resource use, and their implications for adaptation.

Firstly, these findings support the call to avoid obsolete generalizations that may lead to poor policy. For example, the women in the sample felt less connected to the marine environment. Presuming that women are more connected to the environment, and therefore support more 'selfless' conservation attitudes, could lead to climate change adaptation that ignores important contextual realities. Additionally, risk perception is an important factor for motivating climate change adaptation (Adger et al., 2009; Grothmann and Patt, 2005) and women are often thought to be more likely to accept adaptation plans because they are less tolerant of environmental risk (Bord & O'Connor, 1997; O'Connor et al., 1999). But, women in the sample expressed a relatively high tolerance for environmental risk. Therefore, it is important to move past generalizations, and to recognize underlying systems that influence risk, vulnerability, and connection to the environment.

Gendered division of labor can explain many of the significant results, calling attention to the specific way that women relate to and depend on marine resources, and how climate change adaptation must include specific context. The argument that climate change will exacerbate vulnerability of women and increase pre-existing inequalities is partially based on claims that women in developing countries are more reliant than men on natural resources for livelihoods and well-being, and that increasing environmental degradation due to climate change will disproportionately increase women's workload and vulnerability (Brown, 2011; Nelson et al., 2002). Rather than generalize that women are more dependent on natural resources, it is important to acknowledge the specific realm where women have the greatest knowledge, involvement and interest. For example, coral reefs are seen as 'men's space' (Siar, 2003), and women in the sample did not feel as much at risk to coral bleaching as men. But dialogue in the Coral Triangle and elsewhere tends to focus heavily on the devastating impact of climate change on coral reef ecosystems. To better engage women, it is important to also stress impacts on intertidal zones, invertebrate fisheries and fish market values. This is one way to move past generalizations about vulnerability and resource dependency, to incorporate more targeted gender mainstreaming in climate change adaptation strategies.

Finally, it is critical to recognize that women's role in fisheries is still a marginalized one, with persistent systems that mediate access to resources, power, and formal recognition (Harper et al., 2017; Lentisco and Lee, 2015). In this sample, the demonstrated link between gender, labor and natural resources reaffirms that effective climate change adaptation must address the specific vulnerabilities associated with women in fisheries. Building climate resilience should address the underlying causes of marginalization in fisheries and the inequities that create specific vulnerability.

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References

- Adger, W.N., et al., 2005. Successful adaptation to climate change across scales. *Global Environ. Change* 15 (2), 77–86.
- Adger, W.N., et al., 2009. Are there social limits to adaptation to climate change? *Climatic Change* 93 (3–4), 335–354.
- Arora-Jonsson, S., 2011. Virtue and vulnerability: discourses on women, gender and climate change. *Global Environ. Change* 21 (2), 744–751.
- Bennett, E., 2005. Gender, fisheries and development. *Mar. Pol.* 29 (5), 451–459.
- Bord, R.J., O'Connor, R.E., 1997. The gender gap in environmental attitudes: the case of perceived vulnerability to risk. *Soc. Sci. Q.* 78 (4), 830–840.
- Brody, S.D., et al., 2008. Examining the relationship between physical vulnerability and public perceptions of global climate change in the United States. *Environ. Behav.* 40 (1), 72–95.
- Brown, H.C.P., 2011. Gender, climate change and REDD + in the Congo basin forests of Central Africa. *Int. For. Rev.* 13 (2), 163–176.
- Burke, L., et al., 2011. Reefs at Risk: Revisited. World Resources Institute.
- Cornwall, A., 2003. Whose voices? Whose choices? Reflections on gender and participatory development. *World Dev.* 31 (8), 1325–1342.
- Christie, P., et al., 2009. Back to basics: an empirical study demonstrating the importance of local-level dynamics for the success of tropical marine ecosystem-based management. *Coast. Manag.* 37 (3–4), 349–373.
- Christie, P., et al., 2014. Final Report: Lessons from the US Coral Triangle Initiative Support Program. Coral Triangle Support Partnership. USAID.
- Cinner, J.E., et al., 2012. Vulnerability of coastal communities to key impacts of climate change on coral reef fisheries. *Global Environ. Change* 22 (1), 12–20.
- Climate Change Commission, 2011. Philippines National Climate Change Action Plan 2011–2028. NCCAP.
- Combest-Friedman, C., Christie, P., Miles, E., 2012. Household perceptions of coastal hazards and climate change in the Central Philippines. *J. Environ. Manag.* 112, 137–148.
- Davis, J.L., Green, J.D., Reed, A., 2009. Interdependence with the environment: Commitment, interconnectedness, and environmental behavior. *J. Environ. Psychol.* 29 (2), 173–180.
- Daw, T., et al., 2009. Climate change and capture fisheries: potential impacts, adaptation and mitigation. *FAO Fisheries and Aquaculture Technical Paper No. 530*. In: Cochran, K., De Young, C., Soto, D., Bahri, T. (Eds.), *Climate Change Implications for Fisheries and Aquaculture: Overview of Current Scientific Knowledge*, pp. 107–150.
- Demetriades, J., Espen, E., 2008. The gender dimensions of poverty and climate change adaptation. *IDS Bull.* 39 (4), 24–31.
- Djoudi, H., et al., 2016. Beyond dichotomies: gender and intersecting inequalities in climate change studies. *Ambio* 45 (3), S248–S262.
- Eisma-Osorio, L., et al., 2012. A Sourcebook on Mainstreaming Gender into Coastal Resources Management in the Philippines. Coastal Conservation and Education Foundation, Inc., Cebu City, Philippines.
- Food and Agriculture Organization of the United Nations (FAO), 2009. *Climate Change Implications for Fisheries and Aquaculture: Overview of Current Scientific Knowledge*, vol. 530. *FAO Fisheries and Aquaculture Technical Paper*, pp. 25–29.
- Goh, A., 2012. A Literature Review of the Gender-differentiated Impacts of Climate Change on Women's and Men's Assets and Well-being in Developing Countries. International Food Policy Research Institute CGIAR CAPRI Working Paper No. 106.
- Grothmann, T., Patt, A., 2005. Adaptive capacity and human cognition: the process of individual adaptation to climate change. *Global Environ. Change* 15 (3), 199–213.
- Harper, S., et al., 2013. Women and fisheries: contribution to food security and local economies. *Mar. Pol.* 39, 56–63.
- Harper, S., et al., 2017. Contributions by women to fisheries economies: insights from five maritime countries. *Coast. Manag.* 45 (2).
- Jumawan-Dadang, Raquelyn, 2015. Saving marine life: an empirical assessment of eco-feminist thought in coastal communities. *Philippine Socio. Rev.* 63, 61–83.
- Kleiber, D., Harris, L.M., Vincent, A.C.J., 2014. Improving fisheries estimates by including women's catch in the Central Philippines. *Can. J. Fish. Aquat. Sci.* 71 (5), 656–664.
- Lata, S., Nunn, P., 2011. Misperceptions of climate-change risk as barriers to climate-change adaptation: a case study from the Rewa Delta, Fiji. *Climatic Change* 110 (1–2), 169–186.
- Lentisco, A., Lee, R.U., 2015. A Review of Women's Access to Fish in Small-scale Fisheries. Food and Agricultural Organization of the United Nations (FAO) Fisheries and Aquaculture Circular No. 1098. ISSN 2070–6065.
- Mamaug, S.S., et al., 2013. A framework for vulnerability assessment of coastal fisheries ecosystems to climate change—tool for understanding resilience of fisheries (VA-TURF). *Fish. Res.* 147, 381–393.
- Masika, R., 2002. In: Masika, R. (Ed.), *Gender, Development and Climate Change*. Oxfam, pp. 2–9.
- Nelson, V., et al., 2002. Uncertain predictions, invisible impacts, and the need to mainstream gender in climate change adaptations. *Gen. Dev.* 10 (2), 51–59.
- Neumayer, E., Plümper, T., 2007. The gendered nature of natural disasters: the impact of catastrophic events on the gender gap in life expectancy, 1981–2002. *Ann. Assoc. Am. Geogr.* 97 (3), 551–566.

- O'Connor, R.E., Bard, R.J., Fisher, A., 1999. Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk Anal.* 19 (3), 461–471.
- Pollnac, R.B., 1988. Social and cultural characteristics of fishing peoples. *Mar. Behav. Physiol.* 14, 23–39.
- Pollnac, R.B., Crawford, B.R., 2000. Assessing Behavior Aspects of Coastal Resource Use/Coastal Resources Center Coastal Management Report #2226. Coastal Resources Center, University of Rhode Island, Narragansett, Rhode Island.
- Pollnac, R.B., Crawford, B.R., Gorospe, M.L.G., 2001. Discovering factors that influence the success of community-based marine protected areas in the Visayas, Philippines. *Ocean Coast Manag.* 44 (11–12), 683–710.
- Price, J.C., Walker, I.A., Boschetti, F., 2014. Measuring cultural values and beliefs about environment to identify their role in climate change responses. *J. Environ. Psychol.* 37, 8–20.
- Primavera, J.H., Esteban, J.M.A., 2008. A review of mangrove rehabilitation in the Philippines: successes, failures and future prospects. *Wetl. Ecol. Manag.* 16 (5), 345–358.
- SCTR, 2011. State of the Coral Triangle Report. Philippines. Asian Development Bank, pp. 1–4.
- Siar, S.V., 2003. Knowledge, gender and resources in small-scale fishing: the case of Honda Bay, Palawan, Philippines. *Environ. Manag.* 31 (5), 569–580.
- Siason, I.M., 2000. Women in fisheries in the Philippines. *Rev. Women's Stud.* 10 (1–2).
- Tam, J., McDaniels, T.L., 2013. Understanding individual risk perceptions and preferences for climate change adaptations in biological conservation. *Environ. Sci. Pol.* 27, 114–123.
- U.S. Coral Triangle Support Program (USCTI) (Ed.), 2013. Climate Change Adaptation for Coral Triangle Communities: Guide for Vulnerability Assessment and Local Early Action Planning (LEAP Guide) - Version 1. Prepared with Support from United States Agency for International Development (USAID) and Partners, (Bangkok, Thailand).
- Weeratunge, N., Snyder, K., Sze, C.P., 2010. Gleaner, Fisher, trader, processor: understanding gendered employment in fisheries and aquaculture. *Fish Fish.* 11 (4), 405–420.
- WorldFish Center, 2010. Gender and fisheries: do women support, complement or subsidize men's small-scale fishing activities? Issue Brief (Public Policy Inst. Am. Assoc. Retired Persons) 2108, 1–8.